



This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. **(Currently Amended)** A device for transporting a material across a biological barrier, the device comprising:
  - (1) one or more microneedles having at least one substantially annular channel therethrough, and having a length between about 1  $\mu$ m and 1 mm and a diameter between about 1  $\mu$ m and 100  $\mu$ m, and,
  - (2) a substrate to which the one or more microneedles is attached,  
wherein the substrate and/or the microneedles are formed from flexible materials  
allow the device to fit the contour of the biological barrier.
- 2-48. **(Canceled)**
49. **(Previously Presented)** The device of claim 1, wherein the length of the one or more microneedles is greater than the diameter, wherein the length is between about 30  $\mu$ m and 200  $\mu$ m and the diameter is between about 1  $\mu$ m and 10  $\mu$ m.
50. **(Previously Presented)** The device of claim 1, wherein the length of the one or more microneedles is greater than the diameter, wherein the length is between about 100  $\mu$ m and 200  $\mu$ m and the diameter is between about 10  $\mu$ m and 30  $\mu$ m.
51. **(Previously Presented)** The device of claim 1, wherein the length of the one or more microneedles is greater than the diameter, wherein the length is between about 100  $\mu$ m and 200  $\mu$ m and the diameter is between about 20  $\mu$ m and 50  $\mu$ m.
52. **(Previously Presented)** The device of claim 1, wherein the length of the one or more microneedles is greater than the diameter, wherein the length is between about 300  $\mu$ m and 500  $\mu$ m and the diameter is between about 30  $\mu$ m and 100  $\mu$ m.
53. **(Previously Presented)** The device of claim 1, wherein the diameter of the substantially annular channel is between about 3  $\mu$ m and 80  $\mu$ m.
54. **(Previously Presented)** The device of claim 1, wherein the substantially annular channel extends through the entire one or more microneedles from the base to the tip.

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55. **(Previously Presented)** The device of claim 1, wherein the substantially annular channel extends and branches through the one or more microneedles.
56. **(Previously Presented)** The device of claim 1, wherein the substantially annular channel extends through a portion of the one or more microneedles.
57. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles comprise a shaft of substantially uniform diameter.
58. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles comprise a shaft having a base end which tapers to a pointed tip end.
59. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles comprises a shaft, a portion of which has a substantially uniform diameter and a portion of which tapers to a pointed tip end.
60. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles extend at an angle from the substrate.
61. **(Previously Presented)** The device of claim 60, wherein the angle is about 90 degrees.
62. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles are made of a material selected from metals, ceramics, semiconductors, organics, polymers and composites.
63. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles are made of pharmaceutical grade stainless steel, gold, titanium, nickel, iron, gold, tin, chromium, copper, metal alloys, silicon, and silicon dioxide.
64. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles are made of a material consisting of a metal.
65. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles include a biodegradable polymer.
66. **(Previously Presented)** The device of claim 65, wherein the biodegradable polymer is selected from lactic acid and glycolic acid polylactide, polyglycolide, polylactide-co-glycolide, and copolymers with PEG, polyanhydrides, poly(ortho)esters,

polyurethanes, poly(butyric acid), poly(valeric acid), and poly(lactide-co-caprolactone).

67. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles include a non-biodegradable polymer.
68. **(Previously Presented)** The device of claim 67, wherein the non-biodegradable polymer is selected from polycarbonate, polymethacrylic acid, ethylenevinyl acetate, polytetrafluorethylene (TEFLON<sup>TM</sup>), and polyesters.
69. **(Previously Presented)** The device of claim 1, wherein the one or more microneedles are formed by a micromachining technique selected from lithography, plasma etching, wet chemical etching, dry etching, thermal oxidation of silicon, electroplating, electroless plating, boron diffusion, phosphorus diffusion, arsenic diffusion, antimony diffusion, ion implantation, film deposition, sputtering, chemical vapor deposition, epitaxy, chemical anodization, electrochemical anodization, and combinations thereof.
70. **(Currently Amended)** A device for transporting a material across a biological barrier, comprising
- (1) a plurality of microneedles having lengths between 1  $\mu\text{m}$  and 1 mm and widths between 1  $\mu\text{m}$  and 500  $\mu\text{m}$ ;
  - (2) a substrate to which the microneedles are attached, and
  - (3) at least one of the microneedles having at least one groove extending in a longitudinal direction and on an exterior surface, for supporting flow of materials along the groove and across a biological barrier.
71. **(Previously Presented)** A device according to claim 70, further comprising a transport control mechanism for generating a voltage field gradient for providing a force for causing the material to move across a biological barrier.
72. **(Previously Presented)** A device according to claim 70, further comprising a transport control mechanism for generating an ultrasonic force gradient for causing the material to move across a biological barrier.